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315.01 General

Value Engineering is a systematic process designed to focus on the major issues of a complex project or process. It uses a multidisciplinary team to develop recommendations for the important decisions that must be made. The primary objective of a Value Engineering study is *Value Improvement*.

For projects, the value improvements might be improvements in scope definition, functional design, constructibility, coordination (both internal and external), or the schedule for project development. Other possible value improvements are reduced environmental impact, reduced public (traffic) inconvenience, or reduced project cost. The Value Engineering process incorporates, to the extent possible, the values of the design engineer, construction engineer, maintenance engineer, contractor, state and federal approval agencies, local agencies, other stakeholders, and the public. Important design decisions are formulated from the recommendations of the Value Engineering team.

315.02 References

CFR 23 Part 627 Value Engineering

Value Engineering for Highways, Study Workbook, U. S. Department of Transportation, FHWA

Introduction To Value Engineering Principles and Practices, Transportation Partnership in Engineering Education Development (TRANSPED), University of Washington.

315.03 Definitions

Value Engineering (VE) A systematic application of recognized techniques by a multidisciplinary team to identify the function of a product or service, establish a worth for that

function, generate alternatives through the use of creative thinking, and provide the needed functions to accomplish the original purpose; thus assuring the lowest life cycle cost without sacrificing safety, necessary quality, or environmental attributes. Value Engineering is sometimes referred to as Value Analysis (VA) or Value Management (VM).

Project The portion of a transportation facility that WSDOT proposes to construct, reconstruct, or improve as described in the *State Highway System Plan* or applicable environmental documents. A project may consist of several contracts or phases over several years that are studied together as one *project*.

315.04 Procedure

The VE process uses the Eight-Phase Job Plan in Figure 315-1. Only the phases 1 and 7 are discussed in this chapter. A detailed discussion of phases 2 through 6 is in the VE training manual entitled *Introduction To Value Engineering Principles and Practices*.

(1) Selection Phase

(a) Project Selection

Projects for VE studies may be selected from any of the categories identified in the Highway Construction Program including, *Preservation* or *Improvement* projects, depending on the size and/or complexity of the project. In addition to the cost, other issues adding to the complexity of the project design are considered in the selection process. These complexities include: critical constraints, difficult technical issues, expensive solutions, external influences, and complicated functional requirements.

A VE study is required for any federally funded NHS project with an estimated cost of \$25 million or more (CFR 23 Part 627). Other types of projects that usually provide the highest potential for value improvement have a preliminary estimate exceeding \$2 million and include one or more of the following:

- Projects with alternative solutions that vary the scope and cost
- New alignment or bypass sections
- Capacity improvements that widen an existing highway
- Major structures
- Interchanges on multilane facilities
- Projects with extensive or expensive environmental or geotechnical requirements
- Materials that are difficult to acquire or require special efforts
- Inferior materials sources
- Major reconstruction
- Projects requiring major traffic control
- Projects with multiple stages

(b) Statewide VE Study Plan

On a biennial basis, the state VE manager coordinates with the region VE coordinators to prepare the two-Year VE Study Plan with specific projects scheduled by quarter. The VE Study Plan is the basis for determining the projected VE program needs including team members, team leaders, and training. The Statewide VE Study Plan is a working document and close coordination is necessary between the Olympia Service Center (OSC) and the regions to keep it current.

The regional VE coordinator:

- Identifies potential projects for VE studies from the Project Summaries and the available planning documents for future work.
- Makes recommendations for the VE study timing
- Presents a list of the identified projects to regional management to prioritize into a regional Two-Year VE Study Plan. (VE studies other than projects are also included in the plan.)

The State Design Engineer:

- Reviews the regional Two-Year VE Study Plan regarding the content and schedule of the plan.

The state VE Manager:

- Incorporates the regional Two-Year VE Study Plans and the OSC Study Plans to create the Statewide VE Study Plan.

(c) VE Study Timing

Selecting the project at the appropriate stage of development (the timing of the study) is very important to the success of the VE program. Value can be added by performing a VE study any time during project development; however, the WSDOT VE program identifies three windows of opportunity for performing a VE study.

1. Problem Definition Stage

As soon as preliminary engineering information is available and the specific deficiencies or “drivers” are identified, the project scope and preliminary cost are under consideration. This is the best time to consider the various alternatives or design solutions and there is the highest potential that the related recommendations of the VE team can be implemented. At the conclusion of the VE study, the project scope, preliminary cost, and major design decisions can be based on the recommendations.

When conducting a study in the problem definition stage, the VE study focuses on issues affecting project “drivers.” This stage often provides an opportunity for building consensus with stakeholders.

2. Conceptual Design Stage

At the conceptual design stage, the project scope and preliminary cost have already been established and the major design decisions have been made. Some PS&E activities might have begun and coordination has been initiated with the various service units that will be involved with the design. At this stage, the established project scope, preliminary cost, and schedule will define the limits of the VE study. There is still opportunity for a VE study to focus on the technical issues for each of the specific design elements.

3. 30 % Development Stage

At the 30% stage, most of the important project decisions have been made and the opportunity to affect the project design is limited. The VE study focuses on constructibility, construction sequencing, staging, traffic control elements, and any significant design issues that have been identified during design development.

(d) Study Preparation

To initiate a VE study, the project manager submits a Request for Value Engineering Study form (shown in Figure 315-2) to the regional VE coordinator at least one month before the proposed study date.

The regional VE coordinator then works with the state VE Manager to determine the team leader and team members.

The design team prepares a study package that includes project information for each of the team members. A list of potential items is shown in Figure 315-3.

The region provides a facility and the equipment for the study (Figure 315-3).

(e) Team Leader

The quality of the VE study is dependent on the skills of the VE team leader. This individual guides the team efforts and is responsible for its actions during the study. The best VE team leader is knowledgeable and proficient in transportation design and construction and in the VE study process for transportation projects.

For best results, the team leader should be certified by the Society of American Value (SAVE) as a Certified Value Specialist (CVS) or as a Value Methodology Practitioner (VMP).

Team leadership can be supplied from within the region or from other regions, OSC, consultants, or other qualified leaders outside the department. The state VE Manager coordinates with the regional VE coordinator to select the team leader. A statewide pool of qualified team leaders is maintained by the state VE Manager.

(f) Team Members

The VE team is usually composed of five to eight persons with diverse backgrounds that are relevant to the specific study. The team members may be selected from the regions, OSC, other state and federal agencies, local agencies, and the private sector.

The team members are selected on the basis of the kinds of expertise needed to address the major functional areas and critical high-cost issues of the study. All team members must be committed to the time required for the study. For best results, the team members have had VE training before participating in a VE study.

(g) VE Study Requirements

The time required to conduct a VE study varies with the complexity and size of the project, but typically ranges from three to five days.

The VE study Final Report and Workbook include a narrative description of project input information, background and history, constraints and drivers, VE team focus areas, and a discussion of the team speculation, evaluation, and recommendations. All of the team's evaluation documentation (including sketches, calculations, analysis, and rationale for recommendations) is included in the Workbook as part of the Final Report. The number of copies of the Final Report and Workbook is specified by the project manager.

(2) Implementation Phase

The VE team's recommendations are included in the Final Report and Workbook. The project manager reviews and evaluates the recommendations and prepare a VE Decision Document. This document has a specific response for each of the VE team recommendations and a summary statement containing the managers' decisions and schedule for implementation regarding further project development.

The VE Decision Document also includes estimated costs or savings of the recommendations as well as the estimated cost to implement the recommendations. A copy of this document is sent to the state VE Manager so the results can be included in the annual VE report to FHWA.

The VE Decision Document is submitted to the State Design Engineer and a copy becomes a vital element in the design file for the project. Project development then continues based on the decisions developed from the preliminary engineering and the VE study recommendations (barring participation agreements funded by other agencies, utilities, developers, and so forth).

315.05 Documentation

The following documents are to be preserved in the project file.

- ☐ Value Engineering Study Final Report and Workbook
- ☐ VE Decision Document

P:DM3

1. Selection Phase 315.04(1)	Select the right projects, timing, team, and project processes and elements.
2. Investigation Phase	Investigate the background information, technical input reports, field data, function analysis, and team focus and objectives.
3. Speculation Phase	Be creative and brainstorm alternative proposals and solutions.
4. Evaluation Phase	Analyze design alternatives, technical processes, life cycle costs, documentation of logic, and rationale.
5. Development Phase	Develop technical and economic supporting data to prove the feasibility of the desirable concepts. Develop team recommendations. Recommend long term as well as interim solutions.
6. Presentation Phase	Present the recommendations of the VE team in an oral presentation, and in a written report and workbook
7. Implementation Phase 315.04(2)	Evaluate the recommendations. Prepare an implementation plan (VE Decision Document) including the response of the managers and a schedule for accomplishing the decisions based on the recommendations.
8. Audit Phase	Maintain a records system to track the results and accomplishments of the VE program on a statewide basis. Compile appropriate statistical analyses as requested.

Steps 2-6 are performed during the study, see *Introduction To Value Engineering Principles and Practices* for procedure's during these steps.

Eight-Phase Job Plan for VE Studies
Figure 315-1

Project Title:			
SR No.	MP	to MP	Length Subprogram
PIN			WIN
Assigned Project Engineer			
Proposed Advertising Date			
Estimated Right of Way Costs		Estimated Construction Costs	
Design Speed		Projected ADT	
Route Conditions/Geometry: Adjacent Segments			
Overall Route			
Major Project Elements			
Environmental Issues			
Construction Issues			
Suggested Value Team Composition:			
Architecture		Hydraulics	
Bridge		Landscape Architecture	
Construction		Maintenance	
Design		Planning/Programming	
Environmental		Traffic	
Other _____		Real Estate Services	
Region Contact Person		Date's requested for VE study	

Request for Value Engineering Study
Figure 315-2

Project Related Input* (Study Package)	Study Related Facilities and Equipment
Design File	Room w/ large table
Quantities	Phone
Estimates	Photo/Video log access/SRView
R/W Plans	Van for Field Trip **
Soils Reports	Easel(s)
Plan Sheets	Large Tablet Paper (2x2 squares)
Environmental Documents	Colored Marking Pens
X-sections and Profiles	Masking and Clear Adhesive Tape
Land Use Maps	Workbook(s)
Contour Maps	Polaroid Camera
Quadrant Maps	<i>Design Manual</i>
Accident Data	"Green Book"
Traffic Data	Standard Plans
Up to Date Large Scale Aerial Photographs	Standard Specifications
Vicinity Map	M.P. Log
Hydraulics Report	Bridge List
Aerial Photos	WSDOT Phone Book
Existing As-Built Plans	Scales and Straight Edge
	Red Book - Field Tables
	Unit Bid Prices
	Calculators
	Scissors

* Not all information listed may be available to the team depending on the stage of the project.

** If field trip is not possible, provide video of project.

VE Study Team Tools
Figure 315-3